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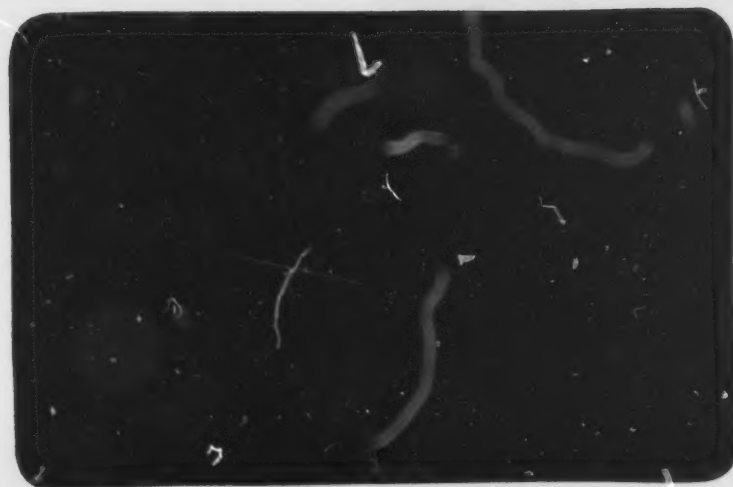
AUTHOR Cusack, Mary Ann
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ABSTRACT

An eight-year project--Project SACI--began in 1969 is introducing technology into Brazil's educational system. It is based upon the hypotheses that technology can deliver education to more students, increase achievement, and provide cost-effective teacher education. To test these hypotheses, Project SACI aims to bring satellite transmission of educational programs to 500 primary schools (grades 1-4) involving 3000 teachers and 25,000 students across a rural area of 100,000 square kilometers. The project's objectives are to: 1) test the efficiency of education based upon technology and a systems analysis approach; 2) develop techniques for producing educational software; 3) discover means of obtaining the acceptance of technologies in rural communities; 4) operationalize satellite and ground delivery systems; and 5) train, at the graduate level, specialists in educational technology and systems analysis. The project is proceeding on schedule through 1974, for teachers and supervisors are being trained, courseware is being developed, and the requisite hardware being prepared, including the projection of a satellite launching in 1976. In addition, in conjunction with Project SACI the graduate program in educational technology has produced its first graduating class. (PB)



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PR - Conselho Nacional de Pesquisas (CNPq)
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São José dos Campos - SP - Brasil

INPE-459-LAFE

SPACE TECHNOLOGY FOR RURAL EDUCATION

BRAZIL EXPERIMENT

by

Dr. Mary Ann Cusack

Project SACI

International Conference of Association
for Educational Communications and Technology

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cc.: 20

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EDUCATION & WELFARE
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This report contains the results of data compiled as well as the actual plans of the SACI Project, publication of which has been authorized by the undersigned.

Fde Mendonça
Fernando de Mendonça

General Director

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Project SACI

Starting from the assumption that the application of technological systems and processes in the educational field may - in less time and with less cost than the traditional system - solve some of the most serious educational problem existing in Brazil, the SACI project was started to introduce advanced technological resources into the educational system.

Studies governing the feasibilities of such a project were started in 1967, one of them, the Rio Grande do Norte Educational Experiment will utilize modern educational resources via ground system and via satellite. It is located in Northeastern Brazil, where the differences existing in the environment represent the characteristics of almost all Brazilian regions. It was the most viable area in which to locate an experiment for later extrapolation to a national system.

Limitations in technical and economic resources, as well as trained personnel available, made it impossible to have all educational levels involved in this experiment. Therefore, INPE made maximum use of the systems analysis approach to reach its objective as directly as possible.

The following chronogram covering all activities, including the introduction of a Graduate Program, was designed as a Master Plan at

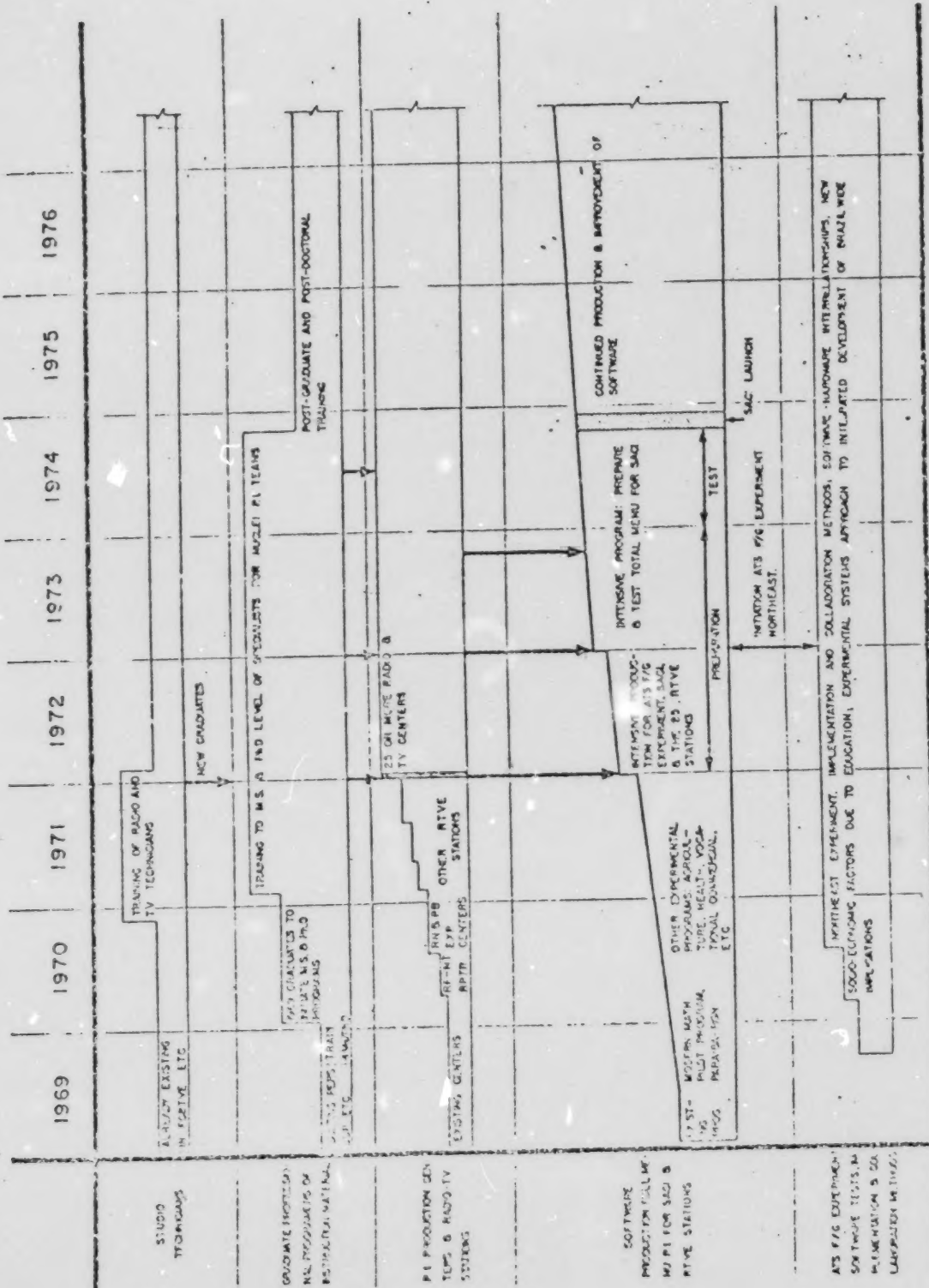


DIAGRAM OF SOFTWARE PRODUCTION ACTIVITIES

the beginning of the project. The INPE program is on target.

In outline form, the following are essential components in the SACI program.

Main Targets: (1) Primary Level - 1st 4 years; (2) qualifying primary teachers.

Bottlenecks in the current system: (1) High % of drop-outs; (2) high % of repeaters.

Work Hypotheses: (1) The Educational technology approach presents better results in terms of student achievement than the traditional system; (2) the qualification of lay-teachers is more cost effective through technology than the traditional system; (3) a greater number of the primary school age population can be reached with greater efficiency than through the traditional system.

OBJECTIVES OF THE PROJECT

1. To test the efficiency of an educational program using TV, radio and printed instructional materials

General and specific educational objectives are established for each course transmitted. Pre-tests, intermediate tests,

and post-tests are used to measure the learning gain. These gains will be compared with the gains of similar but conventional courses.

However, it is not the object of the project to test the efficiency of any one new resource in isolation, but rather to test the use of a combination of modern resources in an experimental learning system.

2. To develop techniques for the production of TV and radio programs for different subject areas, and grade levels.

Inter-disciplinary teams, including educators, communicators, sociologists, and psychologists, are formed to develop and produce modularized TV and radio programs and printed materials.

Data obtained through research carried out in Rio Grande do Norte by these teams in 1973, regarding the needs and attitudes of the students and teachers, will permit a more precise selection of educational criteria for program development in 1974.

Information obtained through highly controlled formative evaluation techniques will make it possible to regulate the presentation of educational material in accordance with the learning capacities of the students involved in the experiment in 1974.

3. To improve or create conditions to better meet the need of the clientele in Rio Grande do Norte, based on the results of formative evaluation

Two aspects are considered:

- a) Through a preliminary technical evaluation, which is called Quality Control, a minimum set of criteria are applied before, during and after the final production of programs and materials in order to introduce improvements before distribution.
- b) The basic operations of educational evaluation will be carried out by a new team formed in March, 1974, in Rio Grande do Norte, composed of educators from INPE/São José dos Campos, INPE/Natal and the Education Secretariate of Rio Grande do Norte (SEEC).

4. To verify the level of acceptance of use of new technologies in the formal school system

Measurement of acceptance will include the following clientele: school personnel, primary school students, parents and community leaders. Intensive research on attitudes expectations, and behavioral changes in Rio Grande do Norte by an interdisciplinary team will furnish us

with data in this area. The methods used will include direct observation, questionnaires, and the measurement of various indices of social change.

5. To test techniques to obtain support from the community for the carrying out of the experiment

Research is being carried out to develop better approaches to obtain greater community involvement and support. The expected end result of this strategy is to implant the SACI experiment in the state system of Rio Grande do Norte, and to provide local personnel with the opportunity to acquire "know-how" in all technical areas of the project.

Early SACI studies of existing conditions prior to the start-up of the project will be up-dated in 1974 in Rio Grande do Norte.

6. To offer better educational opportunities to a considerable portion of the school population in the area of the experiment.

An educational technology system has been introduced in Rio Grande do Norte, an economically and socially depressed area. However, this objective can only be considered attained after the experimental phase is completed, when we can observe the system functioning efficiently and entirely controlled by the state government and the local communities.

Until the present introduction of the SACI system, a very

small portion of the population received the benefit of good educational conditions. Attainment of this goal will be measured by the increase in the number of certified teachers and the number of students attending primary school in Rio Grande do Norte.

7. To develop and test methods for the installation, operation, and maintenance of ground equipment used in the experiment

A sub-system has been introduced to control the logistic aspects of the project, including the distribution of auxiliary equipment, printed materials, and technical problem-solving on site. Special training courses for all logistic personnel will be provided in 1974, through TV and Seminars.

8. To test the utilization of the artificial satellite as an element for distributing a modern system of education

This objective will receive particular emphasis in 1974 since Brazil has the opportunity to utilize one hour and 15 minutes per day of satellite broadcasting through the NASA ATS-F Satellite.

Two reception systems will be tested:

- a) Reception by three local receivers, Natal, Santana and Mossoro. These receivers will retransmit to neighboring

areas.

b) Direct reception in the experimental schools, using special receivers.

9. To analyze the results of the project in terms of cost/benefits, cost/effectiveness, comparing the data from the experimental system with the conventional

A team is formed to quantify "benefit" and "effectiveness". In 1974, SACI plans to develop models to permit the making of inferences regarding the cost/effectiveness of the project, and also to furnish specific information in this area to other educational planners. This task will receive special attention, since the criteria of cost/effectiveness is central to the viability of the proposed national extension of the project.

NOTE: In the context of SACI, we understand "effectiveness" to mean the degree of educational efficiency in the system, and for "benefit", the combination of final products resulting from the project.

10. To prepare personnel for the planning, control and development of material, evaluation and operation of projects in the area of educational technology

This objective is inherent in our goal of acquiring

"know how". It is a regular function of our everyday activities.

However, certain components in the system are specifically organized for the training of personnel. For example, the CEDO courses in Radio and TV given at INPE in the early 70's INPE seminars on systems analysis, and now the new Graduate Program in Educational Technology.

In 1974, we will have the first graduating class in the Master's Program, with 21 candidates. In January of 1974, a new class of 26 candidates started the two-year work/study program. Additional members of the SACI staff are enrolled in "isolated" graduate or technical courses provided free-of-cost by INPE.

In August of 1974, SACI will begin technical training teams in educational materials development, and studio production at INPE/Natal, Rio Grande do Norte.

The benefits from this extensive training of personnel will not only add to the effectiveness of the Project, itself, but also will enable the direct transmission of experience to future programs in educational technology in other regions of Brazil.

FOR TV PRODUCTION INPE MAINTAINS THE FOLLOWING TECHNICAL INSTALLATIONS

1. TV Studio (3 meters by 5 meters and 3.2 meters).

2. Control room.
3. Video Tape and telecine room.
4. TV operation.
5. Photography and film.
6. Photograph and film processing.
7. Graphic arts studio
8. Program library.
9. Film library.

FOR RADIO PRODUCTION INPE MAINTAINS THE FOLLOWING

1. Radio studio (3.6 meters by 3.6 meters).
2. Control room.
3. Sound library.

EQUIPMENT AND INSTALLATIONS

INPE has relatively modest studio equipment, more appropriately called training resources. The result is that great skill and ingenuity is demanded from the staff in extracting the maximum quality and variety possible from existing resources. (This experience is extremely practical in terms of the general lack of technical resources in developing countries).

PROJECT MISSIONS

Mission I
For teachers

1. Training for Supervisors and Teachers.
2. Certification Course = including the content of the first four grades of primary school; Teaching methods and didactics.

Mission II
For students

1. Content for the first grade of primary school by TV.
2. Content for the second grade of primary school by Radio.

Mission III
For teachers

1. Training for Supervisors and Teachers.
2. Certification course including the content of the last four grades of primary school (formerly the Ginassial Course). Teaching methods and didactics.

Mission IV
For students

1. Content of the first and second grades of primary school by TV.
2. Content of the second and third grades of primary school by Radio.

Mission V
For teachers

1. Training for Supervisors and Teachers.
2. Up-grading Course including the content of the 3 grades of secondary school (formerly called Normal School).

- | | | |
|------------------------------|---|--|
| Mission VI
For students | { | 1. Content of the first, second and third grades of primary school by TV.
2. Content of the second, third and fourth grades of primary school by Radio. |
| Mission VII
For teachers | { | 1. Training for Supervisors and Teachers.
2. Course of certification of the Magistério Primário. |
| Mission VIII
For students | { | 1. Content of the first four grades of primary school by TV and Radio. |

The experiment will be carried out in eight phases or missions. During each mission, radio and TV will be used to transmit classes. Programs are broadcast to about 500 schools spread out all over the state, which is about 400 by 250 kilometers. Broadcasting was initiated in 1972, utilizing three AM radio broadcasting stations, and one VHF TV broadcasting station, channel 5, with two retransmitting stations, also VHF channels (2 and 9). The experiment reaches about 3,000 teachers and 25,000 children. Of the 500 schools, 100 are in urban zones and 400 in rural zones.

CRITERIA FOR DELIMITATION OF THE AREA OF THE EXPERIMENT

The geographical area to be involved encompasses 150 of Rio Grande do Norte counties, and contains 2,053 of the 3,439 public schools existing in the state. During the selection of these counties the following criteria were observed:

1. Involvement of the greatest concentration of counties within a geographical area.
2. Inclusion of both rural and urban population in the coastal area, the "agreste" and the "sertão".
3. Inclusion of the greatest number of SEEC centers.
4. Inclusion of the economic poles of the State to coincide with the study underway of economically viable communities.
5. Availability of the greatest possible number of schools in order to select the best for experimentation and control.
6. Technical restrictions on the coverage of TV and radio signals.

CRITERIA FOR SELECTION OF SCHOOLS

In order to validate and generalize the results, the schools were chosen according to the following criteria:

1. All schools must belong to the public school system, state or municipal.
2. Inclusion of the 3 categories of public schools: "Grupo Escolar" (GE), "Escuela Reunida" (ER) and "Escuela Isolada" (EI) from rural and urban zones.*
3. Use of a random selection process for the 3 categories of schools.
4. A sampling which was not less than 25% of the school population of the Experiment area.

Since a primary objective is to test the effectiveness of technologies applied to education, it was necessary to make a comparative analysis between the technological system and the traditional.

The schools involved in the experiment were therefore divided into the following 3 groups:

* GE - A school with a separate classroom for each class, a teacher for each class, a principal, a secretary, etc.

ER - A school with several classrooms and teachers but without any administrative staff.

EI - A school with one room and one teacher.

1. Experiment Group (Exp. G) - composed of 500 schools chosen at random from among those already selected. All "lay" teachers must take part in the up-grading course. The students of both morning and afternoon shifts of these schools receive their classes through the technological system (TV and/or radio). This program started in December, 1972.
2. Control Group I (CG-I) - composed of 50 schools chosen at random. These teachers take part in the training and in the up-grading course in accordance with the criterion established for the Experiment. Classes will be taught under the traditional system, however, and will not receive TV or radio.
3. Control Group II (CG-II) - composed of 50 schools also selected at random. Teachers and students will continue with the traditional system, and do not receive any of the benefits offered to Exp. G/CG-I.

STUDY OF THE AREA INVOLVED

In order to adapt the proposed technology system to the real needs of the region, and to obtain the support of the communities involved, our research embraced the following 4 types of surveys:

1. Teacher characteristics - to obtain detailed information on their needs, values, areas of interest, educational background, professional experience and personal aspirations, involving the 3 categories of elementary teachers existing in the public school system.
2. Student characteristics - to obtain information on their needs, values, learning difficulties and personal aspirations.
3. School characteristics - to obtain information concerning location, administrative dependence, category, construction type, installations, quantity and quality of permanent school material.
4. Community leadership - to identify the communities' leadership in order to get their support for the Experiment, considering that the participation of people and/or community agencies which exert influence on the community is of vital importance when introducing a technological innovation in the education field.

The characteristics of teachers and students were determined by means of a representative sampling method. The survey of the characteristics of the schools covered the universe of schools involved. The community leaders were identified by a crisscrossing study of the opinions collected in a questionnaire applied to each county.

The data-collecting tool utilized has been the questionnaire of direct answers which makes easy the interpretation and the statistical analysis. After the electronic processing of the data an analysis was performed and a report of the results presented the conclusions reached.

The following are a series of graphics which demonstrate the economic, social and educational characteristics of the state of Rio Grande do Norte, site of Project SACI.

RIO GRANDE DO NORTE
Principais Indústrias, segundo Grupos de Pessoal Ocupado
1 9 6 9

Grupo de Pessoal Ocupado	Número de Estabelecimentos	Pessoal Ocupado em 31.12.1969
50 a 99	20	1.255
100 a 249	8	1.430
250 a 499	2	555
500 a 999	1	527
1.000 a mais	1	1.159

FONTE: Instituto Brasileiro de Geografia e Estatística

NOTA: Levantamento anual

RIO GRANDE DO NORTE
Principais Indústrias, segundo Gênero de Atividade
1 9 6 9

Gênero de Atividade	Nº de Estabelecimentos	Pessoal Ocupado (31.12)
-Produtos Alimentícios	271	2.990
-Têxtil	36	1.909
-Vestuário, calçado e artefatos de tecidos	15	1.545
-Minerais não metálicos	135	942
-Editorial e Gráfica	15	431
T O T A L	472	7.817

FONTE: Instituto Brasileiro de Geografia e Estatística

NOTA: Levantamento anual.

RIO GRANDE DO NORTE

ENSINO PRIMÁRIO

Prédios e Salas, segundo a Localização e Dependência Administrativa

1971

DEPENDÊNCIA ADMINISTRATIVA	Unidades			Salas de Aula			Matrícula			Relação Sala/Unidade			Relação Matrícula/Sala		
	TOTAL	URBANA	RURAL	TOTAL	URBANA	RURAL	TOTAL	URBANA	RURAL	TOTAL	URBANA	RURAL	TOTAL	URBANA	RURAL
Federal	15	12	3	26	22	4	1.705	1.429	276	1,7	1,8	1,3	65,6	65,0	69,0
Estadual	1.240	472	768	2.154	1.259	795	125.631	96.460	29.221	1,7	2,9	1,0	58,3	76,6	36,7
Municipal	2.321	478	1.843	2.548	648	1.900	91.496	31.279	60.217	1,0	1,3	1,0	36,0	48,2	32,0
Particular	206	190	16	588	536	22	19.619	19.205	414	2,7	2,8	1,3	35,0	36,0	19,0
TOTAL GERAL	3.782	1.152	2.630	5.286	2.565	2.721	238.501	148.373	90.128	1,4	2,2	1,0	45,1	58,0	33,0

FONTE: ASP/SEEC

RIO GRANDE DO NORTE

População Total, Taxa de Crescimento, População até 6 Anos, População de 7 a 14 Anos, Densidade por MURPS e Municípios-Sede - 1970

MUNICÍPIOS	POPULAÇÃO			Taxa de Crescimento Demográfico		População até 6 anos			População de 7 a 14 anos				
	TOTAL	Urbana	Rural	Urbana	Rural	TOTAL	Urbana	Rural	Densidade	TOTAL	Urbana	Rural	Densidade
1º MUNICÍPIOS	566.030	348.141	217.889	3,2	3,3	105.847	63.102	40.745	13,1	134.506	82.721	51.785	16,5
Natal - Capital	270.127	263.172	6.955			50.513	49.213	1.300	293,7	67.532	66.776	1.756	392,6
2º MUNICÍPIOS	266.564	130.664	135.900	3,6	3,5	49.847	24.434	25.413	4,4	60.812	29.797	31.015	5,1
Mossoró	101.275	80.922	20.353			18.938	15.132	3.806	6,7	24.306	19.420	4.886	8,6
3º MUNICÍPIOS	154.815	63.731	91.084	3,0	3,0	28.950	11.917	17.033	3,7	37.429	15.421	22.008	4,8
Caicó	39.091	25.408	13.683			7.310	4.751	2.559	5,5	10.554	6.860	3.694	7,9
4º MUNICÍPIOS	132.717	34.719	97.999	3,2	3,1	24.618	6.492	18.126	6,5	31.446	8.207	23.239	8,2
Fau dos Ferros	15.524	8.967	6.557			2.922	1.677	1.245	11,1	3.906	2.242	1.664	14,9
5º MUNICÍPIOS	138.239	44.213	94.026	3,7	3,8	25.850	8.267	17.583	2,7	31.195	9.982	21.213	3,2
Angicos	14.372	5.568	7.804			2.687	1.228	1.459	2,5	3.161	1.444	1.717	2,8
6º MUNICÍPIOS	123.127	44.845	78.282	3,5	3,8	23.025	8.386	14.639	5,4	27.323	9.945	17.378	6,5
Santa Cruz	20.607	9.382	10.705			3.860	1.866	2.002	6,2	4.551	2.193	2.358	7,4
7º MUNICÍPIOS	123.886	36.083	92.803	3,7	5,6	24.101	6.747	17.354	9,8	29.311	8.177	21.134	12,0
Nova Cruz	22.334	8.554	13.780			4.176	1.599	2.577	17,7	4.913	1.881	3.032	20,8
8º MUNICÍPIOS	101.228	48.669	52.559	3,8	3,9	18.929	9.101	9.828	3,7	22.292	10.722	11.570	4,4
João Câmara	19.323	8.507	10.736			3.613	1.305	2.008	4,6	4.251	1.887	2.364	5,4
TOTAL ESTADO	1.611.606	751.064	860.542	3,2	3,4	301.370	140.449	160.921	5,7	374.314	174.972	199.342	7,0
TOTAL CAPITAL	270.127	263.172	6.955	3,4	3,3	50.513	49.213	1.300	293,7	67.532	66.776	1.756	392,6

FONTE: Síntese Preliminar do Censo Demográfico - RN/1970

ASP/SEEC

RIO GRANDE DO NORTE
ENSINO PRIMÁRIO
Quantificação e Qualificação do Pessoal Docente
1967/1971

ANOS	TOTAL	NORMALISTAS		NÃO NORMALISTAS	
		Quantifi- cação	%	Quantifi- cação	%
1967	6.679	1.442	21,6	5.237	78,4
1968	7.048	1.669	23,7	5.379	76,3
1969	7.100	1.726	24,4	5.374	75,6
1970	7.624	1.893	24,8	5.731	75,2
1971	8.434	2.429	28,8	6.005	71,2

FONTE: ASP/SEEC

Demonstrativo da Situação Salarial do
Professor
1971

CATEGORIA	Nº de horas/ aula semanal	Nº de horas/ aula mensal	Custo hora/ aula Cr\$	Vencimento mensal - Cr\$
PROFESSOR DO ENSINO - 5 Com curso Pedagógico de grau colegial	24	108	2,00	216,00
PROFESSOR DO ENSINO - 6 Com Curso Pedagógico de grau ginasial	24	108	1,50	162,00
PROFESSOR DO ENSINO - 7 Regente de Classe de grau primário	24	108	1,20	129,60

FONTE: ASP/SEEC

RIO GRANDE DO NORTE
ENSINO PRIMÁRIO
Taxa de Produtividade, a nível de 4 séries
1964/1971

PERÍODO	TAXA DE PRODUTIVIDADE
1964/67	9,1
1965/68	9,7
1966/69	10,5
1967/70	11,1
1968/71	11,5

FONTE: ASP/SEEC

RIO GRANDE DO NORTE
ENSINO PRIMÁRIO
Índice de Evasão
1966/1971

PERÍODOS	Da 1a. para a 2a.série	Da 2a. para a 3a.série	Da 3a. para a 4a.série	Da 4a. para a 5a.série
1966/67	41,3	19,9	22,9	11,7
1967/68	40,7	14,6	22,7	18,3
1968/69	43,7	14,4	20,4	16,4
1969/70	42,2	13,9	26,0	20,1
1970/71	38,4	11,6	19,3	23,4

FONTES: Fundação IBGE - 1966
ASP/SEEC

OPERATIONAL STRUCTURE

In developing the experiment, the existing organizations in the area were used as fully as possible, as represented in Tables 4 - 5.

OBSERVATIONS

1. Ministerial, state and county agencies are providing material and technical assistance to INPE, according to their specializations.
2. INPE is in charge of the coordination of the experiment.
3. Local working groups comprise the following:
 - Training team: which prepared supervisors and teachers to carry out their functions.
 - Transmission team:
 - Logistic team: for transportation, communication and maintenance.
4. System A of supervision includes state and municipal supervisors who were selected by the Secretariat of Education and Culture of Rio Grande do Norte. Their principal function is to supervise and assess the teachers participating in the up-grading course.
5. System B supervision includes approximately 10 classes of each grade the schools in the Experiment and includes personnel from INPE and SEEC/RN. The

objective of this system is to obtain more systematic data on the program.

STUDIO IN NATAL

The studios in São José dos Campos are producing 3 - 4 TV and 5 - 10 radio programs daily. Our TV studio at the area of experimentation (Natal) will soon be operational in order to help with the production of the classes for the 1st grade students.

THE SYSTEM ANALYSIS APPROACH TO SACI

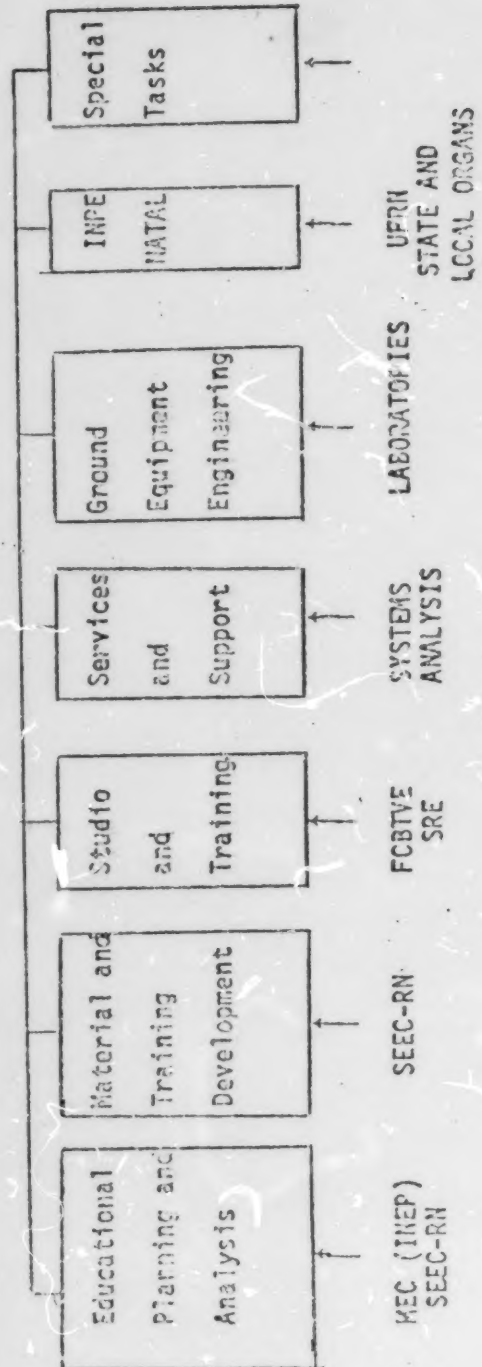
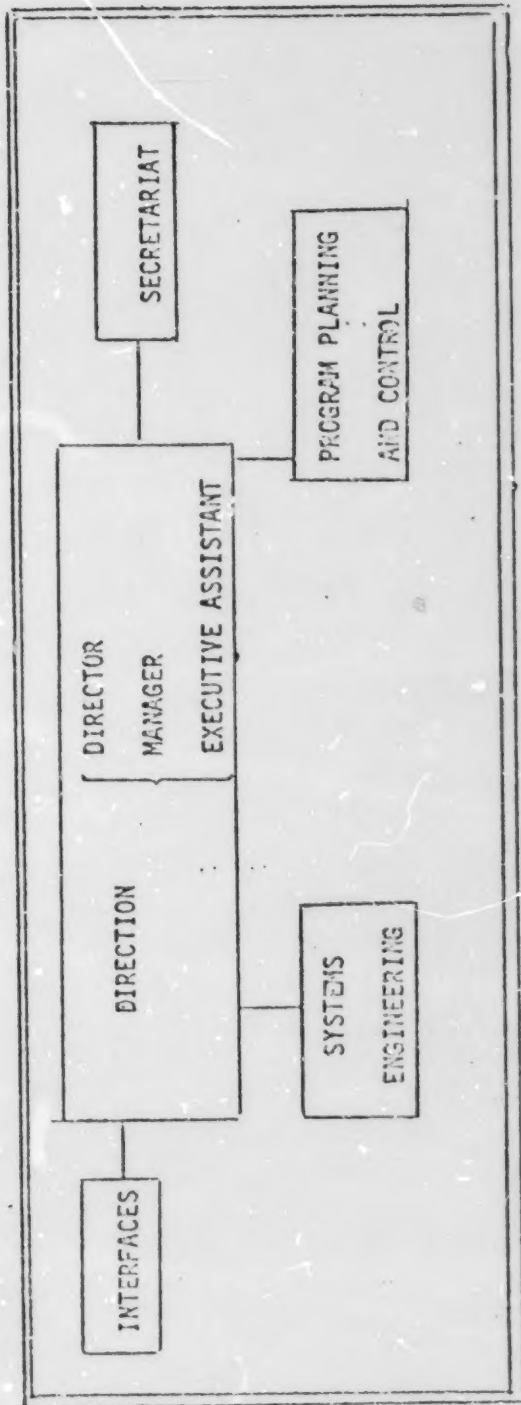
In order to reach its objectives as efficiently as possible, INPE utilizes the systems approach in planning, implementation, training, and evaluation for the SACI project.

Each of the 8 missions is divided into 6 phases:

1. Planning
2. Development
3. Production
4. Pre-operation
5. Operation
6. Evaluation.

These activities are carried out by highly specialized groups:

PROJECT SACI



Operação

MISSÃO	SÉRIE	VEÍCULO	CUSTOS Cr\$ 1000.				
			TRANSPORTE	TRANSMISS.	RECEPÇÃO	MANUTENÇÃO	TOTAL
III	5 ^a e 6 ^a	TV	11,1	194,5	59,0	124,7	389,3
		RA	11,8	131,7	8,0	124,7	276,2
	Treinem.	TV e RA	2,4	24,2	0,4	1,4	28,4
SUB - TOTAL			25,3	250,4	67,4	250,8	693,9
IV	1 ^a	TV	33,0	5,0	12,3	26,0	76,3
	2 ^a	TV	25,0	287,0	12,3	26,0	350,3
	2 ^a	RA	22,6	25,0	1,7	26,0	75,3
	3 ^a	RA	20,4	52,5	1,7	26,0	100,6
SUB - TOTAL			101,0	369,5	28,0	104,0	602,5
TOTAL			126,3	719,9	95,4	354,8	1296,4

Avaliação

MISSÃO	SERIE	VEÍCULO	CUSTO ESTIMADO Cr\$ 1000,00			
			PRODUÇÃO	TRANSPORTE	ANÁLISE	TOTAL
III	5 ^a a 8 ^a	TV e RA	21,0	2,9	20,2	44,1
IV	1 ^a	TV	42,0	4,9	40,3	87,2
	2 ^a	TV	32,7	3,4	31,4	67,5
	2 ^a	RA	50,9	5,3	48,9	105,1
	3 ^a	RA	28,2	2,9	27,1	58,2
SUB-TOTAL			153,8	16,5	147,7	318,0
TOTAL			174,8	19,4	167,9	362,1

Resumo da estimativa de custos para as Missões III e IV.

MISSÃO	CUSTO ESTIMADO Cr\$ 1000,00			TOTAL
	PRODUÇÃO	OPERAÇÃO	AVALIAÇÃO	
III	4844,9	693,9	44,1	5582,9
IV	5015,4	602,5	318,0	5935,9
TOTAL	9860,3	1296,4	362,1	11518,8
AQUISIÇÃO DE EQUIPAMENTOS				986,0
TOTAL GERAL				12504,8

PART II

AREAS OF CONCENTRATION IN 1974

1. EDUCATIONAL PLANNING

Educational planning is carried on by the Project Manager through the Educational Materials Development Group at INPE/São José dos Campos. This includes planning for each Mission, elaboration of curriculum, study of characteristics of the clientele, definition of the general behavioral objectives of each curriculum area, determination of the central theme of each unit, integration of the activities of each area, establishment of the basic characteristics of the programs, the number of programs for each unit, and directions for studio production.

The actual production of the programs is carried out by the studio Group. At present all TV and radio programs are recorded at INPE/São José dos Campos and copies are sent to Natal.

In 1974, INPE will cooperate with Channel II, Fundação Padre Anchieta, in São Paulo, in planning packaging programs for teachers in Rio Grande do Norte, based on Channel II's national Madureza Project which is a condensed junior highschool level education for out-of-school adults.

2. PROGRAMMING

INPE has created a program technique for primary school instruction which will be used in 1974 to meet the psychological, educational, and production needs of the clientele in Rio Grande do

Norte more effectively.

It is the modular format. Modules, or program segments, 30 seconds to 3 minutes in duration, form inter-changeable component parts of complete programs. These 15 minute programs are a montage of modules prepared to meet specific educational objectives.

The formats most often used are: dramatization, animations, "table-tops", graphics, photographs, and films.

This program design takes into consideration the educational criteria of Unidades Pedagógicas in which diverse activities are integrated into a common nucleus of instruction.

Altogether, 673 modules have been produced and edited for use in first grade programming.

Radio production also utilizes the modular approach. The average number of modules per program is eight. This technique allows SACI to capitalize on the language most characteristic of modern radio, the jingle, the "spot", short dramatizations, and concise information presentations.

The montage of radio modules follows the same educational criteria as the TV programming, including the integration of instructional areas.

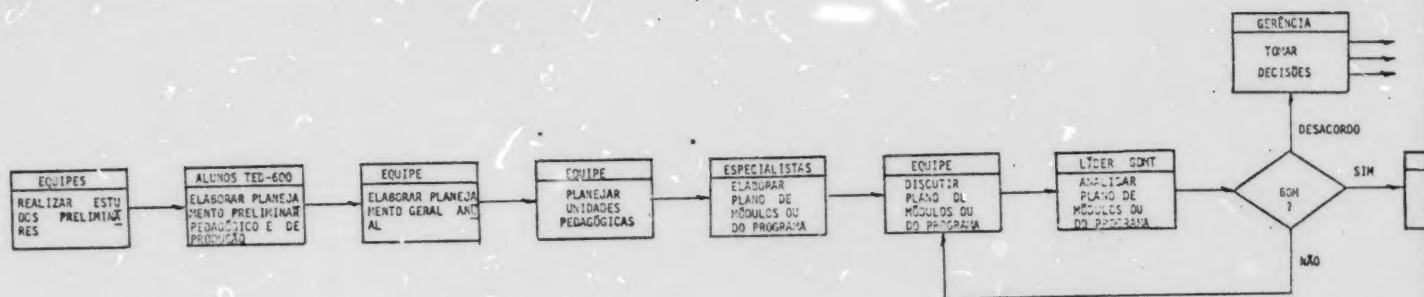
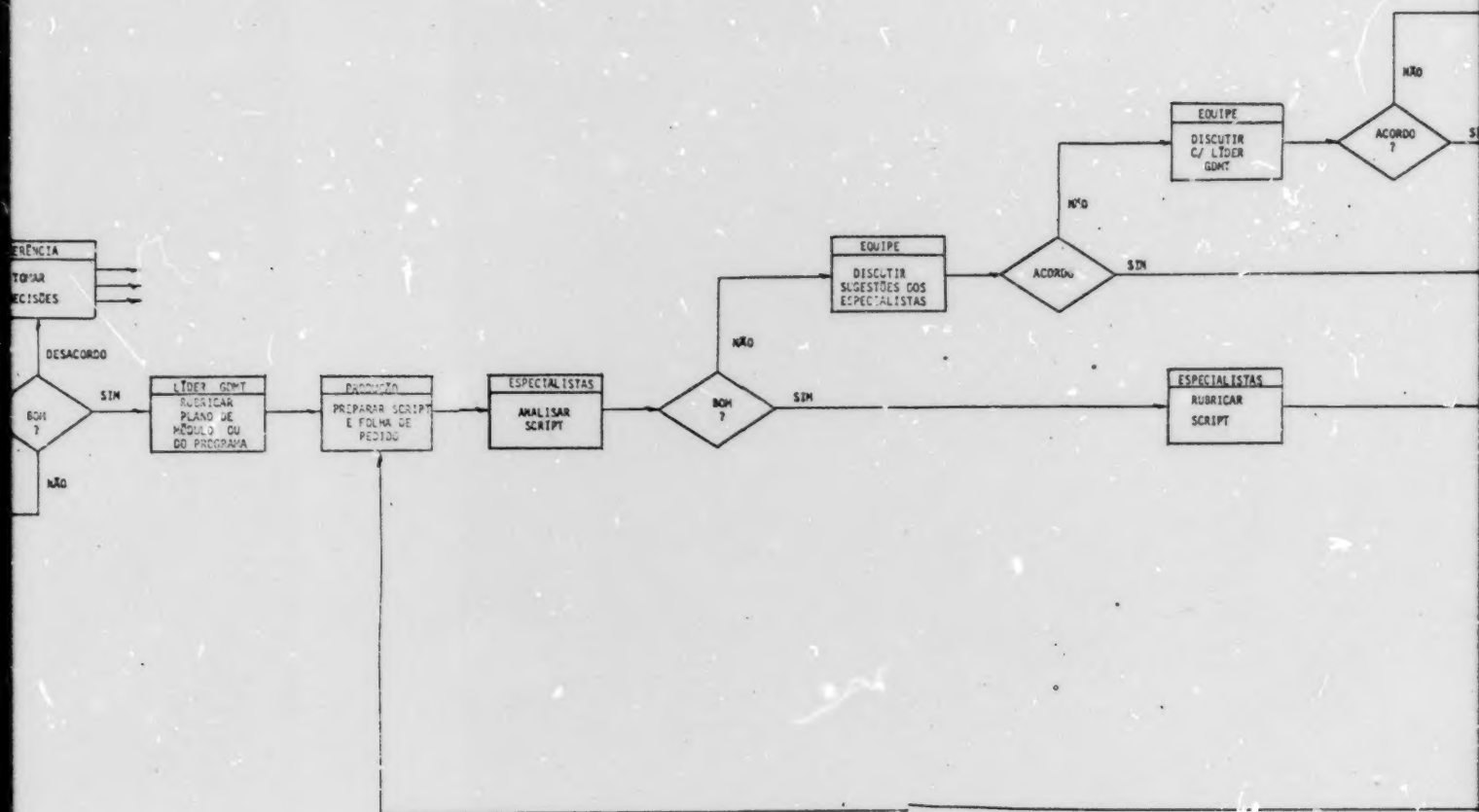
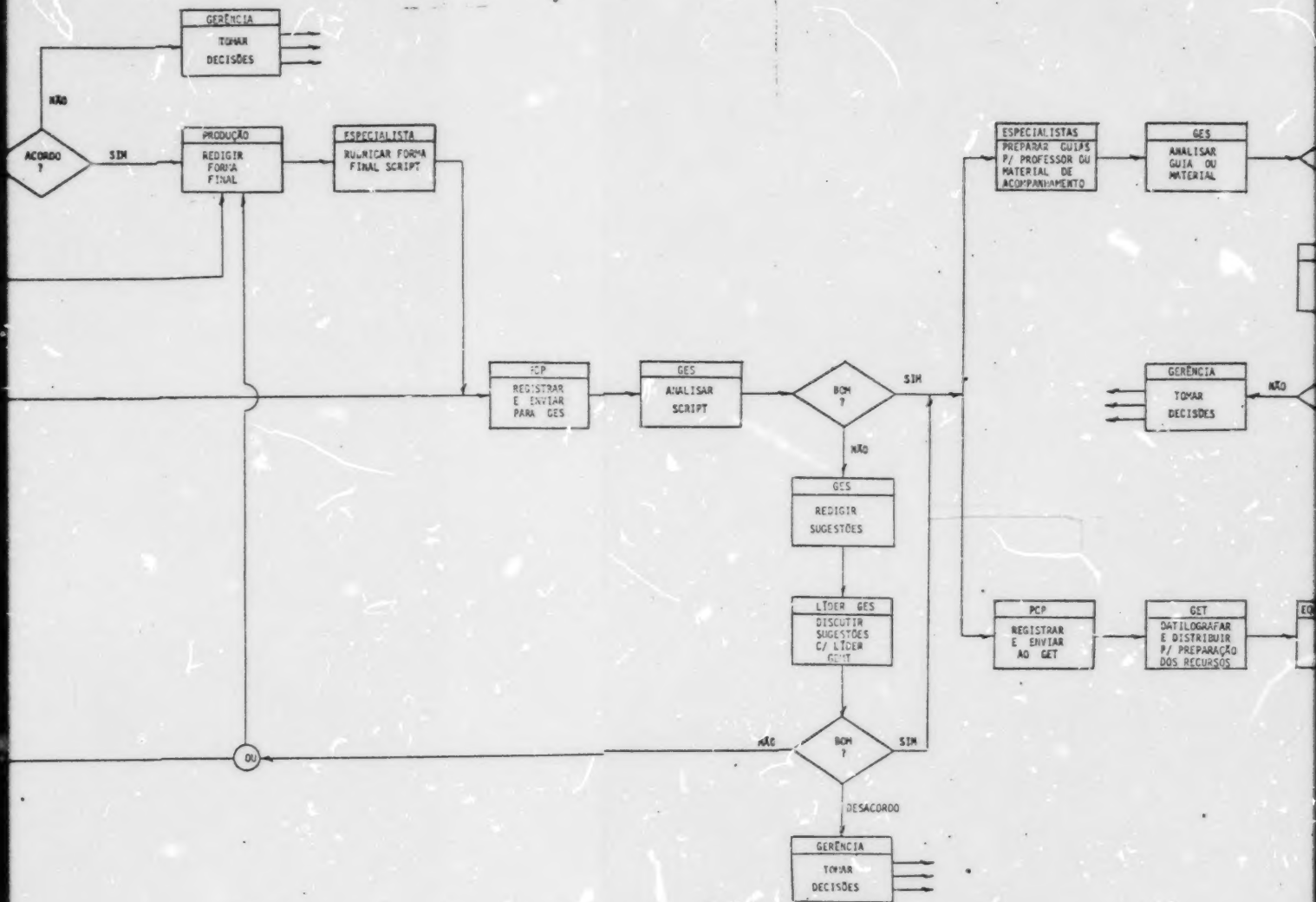
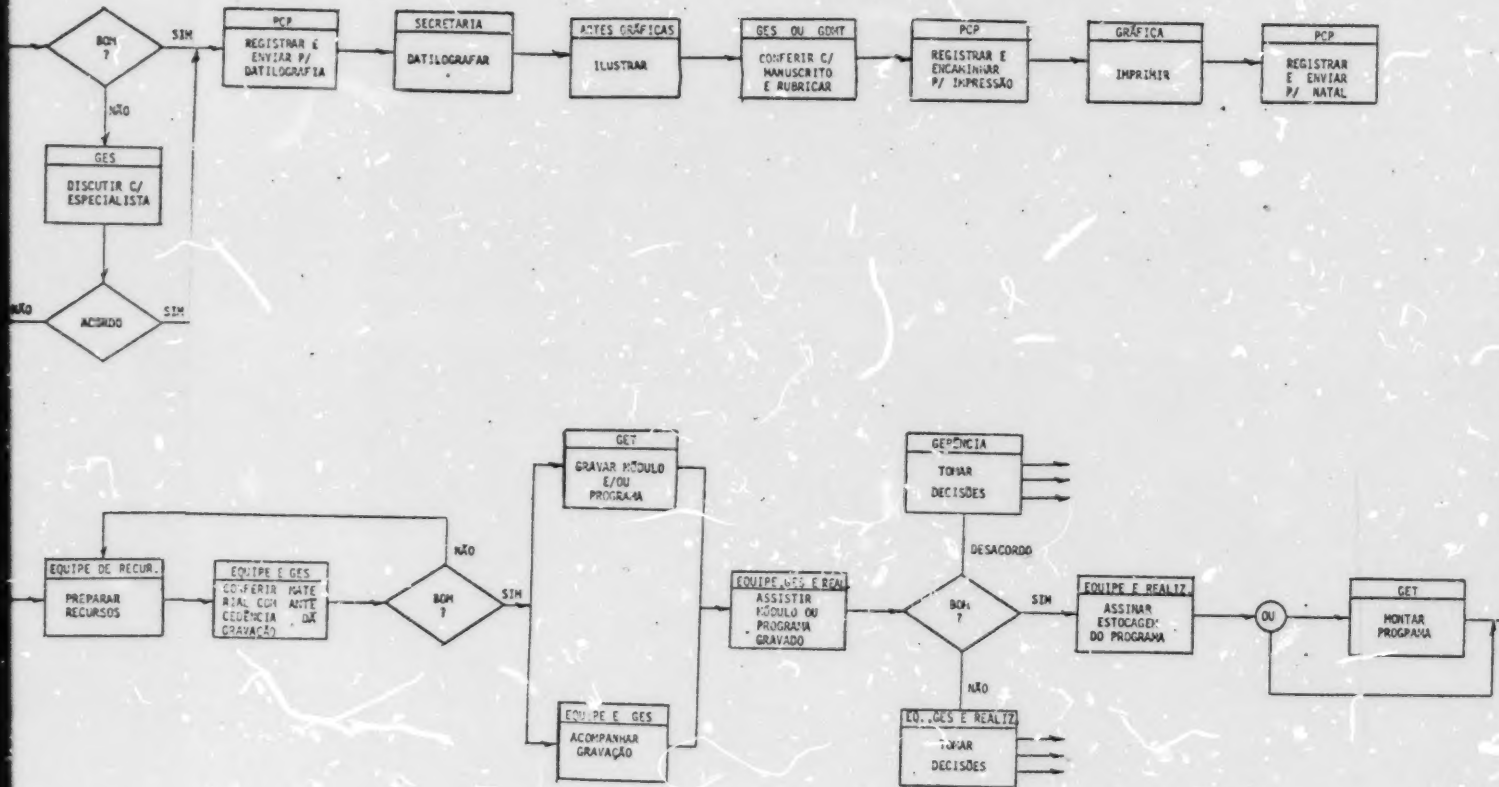


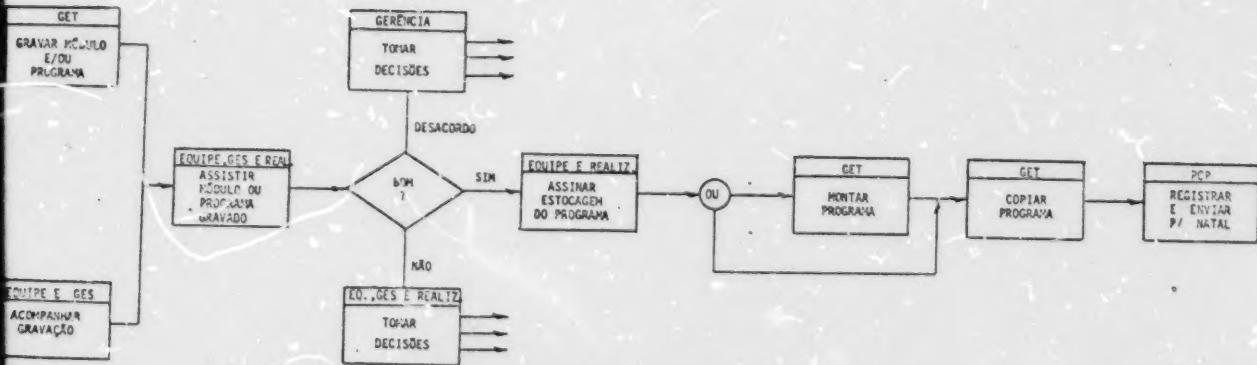
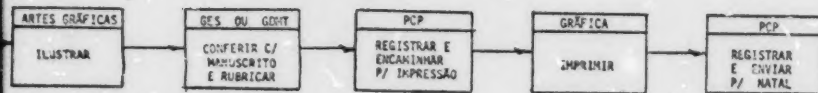
DIAGRAMA DE FLUXO DE TRABALHO - DESE



NO - DESENVOLVIMENTO DE MATERIAL INSTRUCCIONAL







PROGRAMA GERAL DE ATIVIDADES PARA 1974

1973 1974

	JUL.	AGO.	SET.	OUT.	NOV.	DEZ.	JAN.	FEB.	MAR.	ABR.	MAY.	JUN.	JUL.	AGO.	SET.	OUT.	NOV.	DEZ.	1975
RESPONSÁVEL																			
Alunos do Mestrado	Δ																		
GES																			
GM/GET																			
GPAE																			
GSA																			
Gerência																			
GT-JEC-CIPq-RN																			
Órgãos convenientes																			
Especialistas																			
Produtores																			
Especialistas																			
GET																			
GE nº 1																			
Produtores																			
GET																			
GE nº 2																			
GE nº 2																			
GE nº 2																			
GSA																			
GSA																			
GSA																			
GSA/SEEC																			
GSA																			
GPA/GSA																			
Divisão de Ensino																			
GES																			
GT-JEC-CIPq-RN																			
Grupos Funcionais																			
Alunos do Mestrado																			
GM/GES																			
GSA																			
GE nº 3																			

Δ Início Previsto
Δ Término Previsto

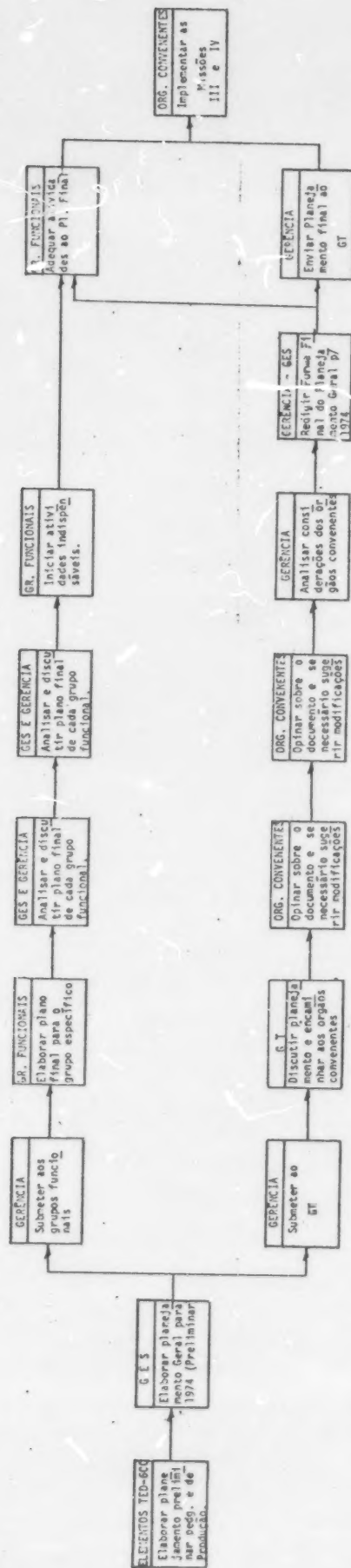


DIAGRAMA DE FLUXO DE TRABALHO - PLANEJAMENTO GERAL PARA 1974 (MISSÕES III E IV)

OBSERVAÇÃO: GT - Grupo de Trabalho do Convênio MEC/CNPQ/RN

3. TEACHER'S GUIDES - INSTRUCTIONAL MATERIALS

Teacher's Guides are planned, and printed at INPE/São José dos Campos and are considered highly significant in SACI's instructional system.

The Guides, distributed weekly to the teacher, develop and reinforce subject matter treated in each broadcast program, and offer suggestions for follow-on activities. A demonstrable outcome of this operation is expected to be greater creativity in the classroom.

In 1974, 150 editions of the Teachers Guide will be produced. In addition, student Notebooks have been designed and produced by Editora do Brasil S/A to reinforce the learning system.

Other supplementary reading materials, including illustrated texts, will be developed and printed at INPE/São José dos Campos. Maps, charts and flags will be distributed for classroom use. INPE and the Ministry of Education in Rio Grande do Norte jointly provide these materials.

4. SUPERVISORY NETWORK

A total of 56 State Supervisors were trained by the project before the initiation of Mission I.

The supervision network was formerly a formidable obstacle in the system, due to the increased workload, difficulties in transportation

and low salary levels, as well as the frequency of introducing new, untrained substitutes into the SACI system.

To solve these problems, an agreement was made with SEEC in 1974 to make available 15 supervisors, to the SACI project, on a full time basis, and to provide them with adequate salaries, transportation and training.

There is now a Coordenator of Educational Supervision in each Regional Center. The distribution of schools into System A (general) and System B (controlled) is directly linked to the supervision component of the project.

The supervisor will visit the schools frequently, fill out observation questionnaires hold a monthly meeting with all teachers in the SACI project under her direction in order to provide information and instruction on teaching methods. The teachers will be given an opportunity to comment on their experiences, including classroom and community problems. Supervisors will provide continuing motivation, direction, and feed-back to the project.

5. TRANSMISSION

The transmission of radio programs will be carried by stations of the Rural Assistance Service in Natal, Mossoro and Caico. They are medium wave stations with transmissions of 1 km.

The transmission of television programs will be carried out by a station in Natal, and retransmitted to Serra do Santana and Mossoro.

In April of 1974, an innovation will be introduced in terms of transmission by the NASA ATS-F Satellite. TV programs will be transmitted for the first grade classes directly from São Paulo by Satellite. The transmission will be received by stations in Natal, Santana, and Mossoro, which will retransmit to their respective areas.

In 10 schools not covered by the above system, special antennas will be installed for direct reception of the satellite. Therefore, we will be testing two modes of reception and rediffusion via satellite. During the past year, in various schools of the experiment, we observed negative changes in the classes or in the students as the result of the out of-school work activities related to planting of crops and harvesting. This generated noise in the system. In order that this will not occur in 1974, all programming will be repeated so that the same subject matter will reach both morning and afternoon school sessions.

6. RECEPTION

TV and Radio equipment for the reception of programs was installed in the experimental schools according to the following design.

During the past year, we concluded that maintaining radio and TV equipment in the same school was not cost/effective, in view of the fact that much of the content was repetitious. Therefore, in 1974, INPE will redistribute these radios to other classes or schools which previously were outside of the experiment, thus increasing the number of teachers and students in the system.

In the SACI project, 80% of the schools do not have the benefit of electricity. To overcome this deficiency, the radio schools receive batteries every two months, and TV schools receive recharged batteries every two weeks.

To reduce operational costs in 1974, the INPE Engineering Group will study other sources of energy supply.

SCHOOL INSTALLATIONS - 1973				
REGION	RADIO	TV	TV & RADIO	TOTAL
I	18	16	10	44
II	23	28	26	77
III	48	75	52	175
IV	100	48	16	164
TOTAL	189	167	104	460

7. INTERFACES

One of INPE/Natal's most important functions is operation of the information control system. This system has two purposes.

1. Immediate correction of specific errors.
2. Collection of information to determine the "grade of efficiency" of the sub-system, and to reformulate planning.

For this coordination, a scheme of interfaces is essential, in view of the participation of various Federal, States and Municipal entities, as well as the distances involved in the project.

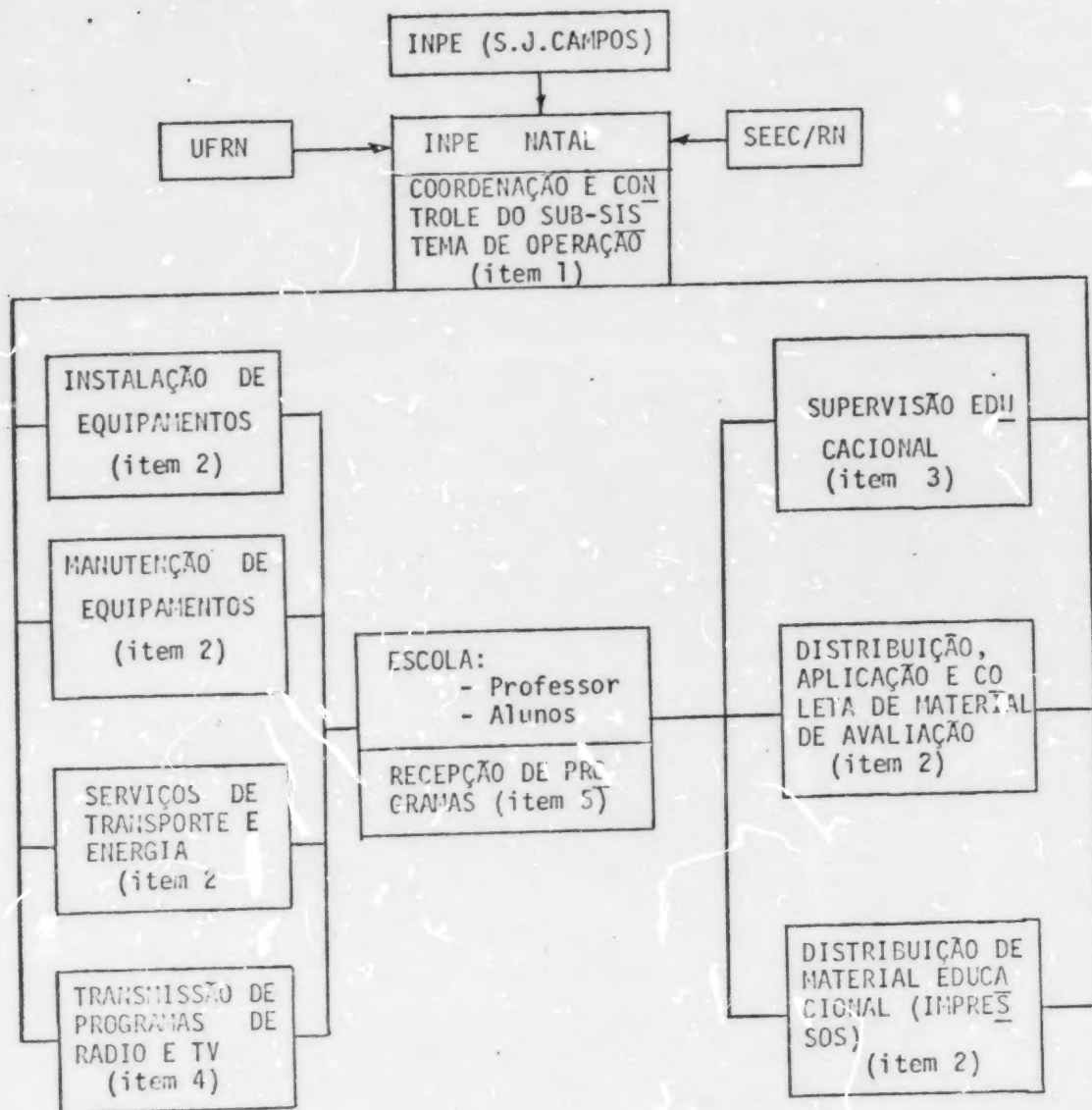
Communication is maintained through daily radio contact, weekly pouch mail, and periodic visits. From the beginning, the INPE sub-system of operations has been linked with staff members of SEEC. The new supervisory system will reinforce this link, and help develop new techniques for future cooperation.

INPE interfaces with the Federal University of Rio Grande do Norte (UFRN), and utilizes the TV channel allocated to the University for educational programming. In 1974, the Natal production team will be trained by INPE in these studios.

INPE interfaces with the Mayors of each city. This function includes the direct participation of municipal schools in the experiment, utilization of municipal buildings as sub-centers, as well as municipal personnel for the operation of the sub-centers.

CONFIGURATION OF THE RGN SYSTEM OF OPERATIONS

REGION	REGIONAL CENTER	Nº OF MUNICIPALITIES IN THE SUB-CENTER
I	Mossoro	1
II	Lages	8
III	Natal	36
IV	Currais Novos	25



EVALUATION

Several basic modifications will be applied in the system of educational evaluation in 1974.

- a) The supervisory system will be extended, up-graded and intensified to permit an increase in direct observation and feedback regarding learning conditions in the classroom.
- b) The number of schools will be reduced in the sample to be used for rigorous measurement of educational change to increase the reliability of evaluation data.
- c) Evaluation instruments used in 1973 will be reduced, simplified, and tailored more specifically to meet immediate feedback needs to increase quality control in 1974.
- d) Special attention will be given to measuring changes in the drop-out and repeater rate in relation to Project SACI.

UTILIZATION OF THE RESULTS

The purpose of testing the teachers is primarily to measure learning gain and to acquire feedback for reformulation and

CEV

INPE's Economically Viable Communities Project (CEV) is complementary to the aims of the SACI Project. The purpose of CEV is to prepare communities to develop human and material resources in order to attain a higher standard of living.

SACI schools will be opened at night for adult audiences, who will be organized into Teleclubes, to receive Televised information on specific subjects such as agriculture, animal husbandry, cooperatives, health and child care, and community development.

A discussion period will follow, led by a community leader who will act as a monitor, applying group dynamic techniques to guide the audience toward decision-making.

Following the results of the Pilot Project now underway in Rio Grande do Norte, SACI plans to expand the project to include 500 Teleclubes.

Interfaces have been made between INPE and State, Municipal, and private agencies in Rio Grande do Norte to provide technical assistance and physical support.

improvement of SACI's instructional system. The results of the tests will also be used as the basis for certifying teachers, and ultimately increasing professional levels and salaries.

The purposes for testing the students are similar. However, the main objective is to measure the effectiveness of the instruction, rather than the student. It remains for the teacher to judge the capability of each student, a judgement which must include direct, personal observation.

RESEARCH

Research will be carried on concerning the rate, retention and transfer of learning in the SACI system. A project in Global Evaluation will be initiated to try to measure the impact of the combination of factors operating in the project, and to determine cause and effect.

INPE will examine the effects of the project and of exposure to TV in general on the structures of three types of communities. Through observations and interviews, material will be gathered on the role of community leaders in facilitating or hindering the goals of the project, on the effects of the project on power relationships within the community, on patterns of social interaction, on the use of new agricultural techniques, on change in health care procedures, etc.

PART III

SATELLITE PLANNING

SATELLITE PLANNING

The Brazilian Government set up in June 1972, a high level commission, formed by the key personnel of Brazilian agencies interested and related to the Domestic System, to analyze the general concepts of a Satellite system, along the lines proposed by INPE in 1967.

A first satellite should be launched in the geostationary satellite orbit about 1976. Its probable configuration will encompass one TV channel, with educational purposes, in 2.5 GHz band allocated to the Broadcasting Satellite Service in WARC, and a large number of the telephony transponders, for telecommunication purposes, in the 6 - 4 GHz band.

Its probable location, taking into account several criteria, is from about 72 to about 83 degrees west longitude.

Summing up, the advantages of satellite communications for Brazil are:

1. Augments national telecommunication network
 - a. Cost benefits for long distance
 - b. Facility diversity for service restoration
 - c. Rapid response to unanticipated traffic
 - d. Instantaneous network for National Television Broadcast.

2. Provides unique services

- a. Television for remote areas
- b. Telephony to isolated communities
- c. Low cost instructional television distribution
- d. National security communication network.

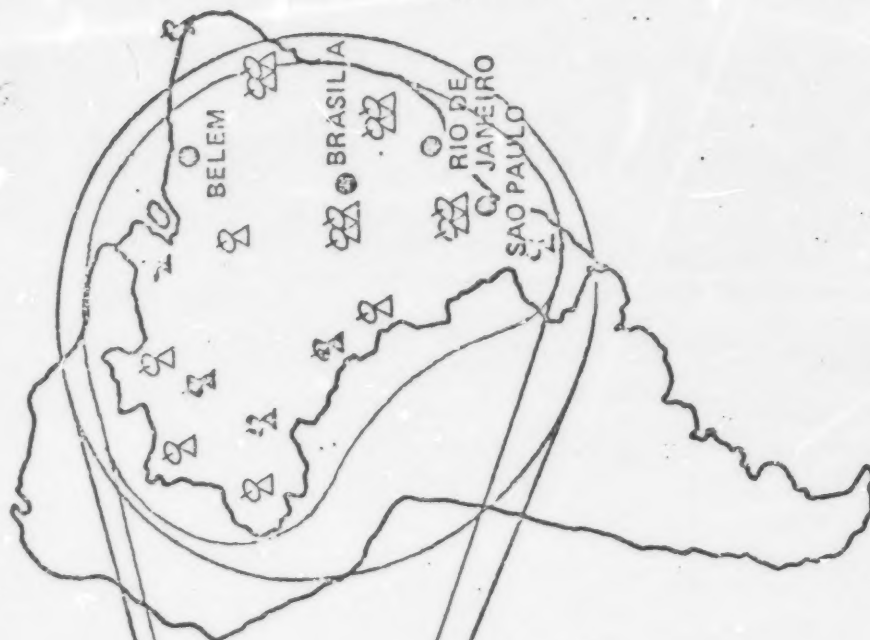
A satellite system is the least costly of the means of reaching any point within the country, such as the frontier villages. In certain cases, it is the sole means of communicating very confidential matters. This method involves the shortest installation period required by any nation-wide communications system. In addition, that portion of the satellite used for communications purposes could well provide a reasonable source of income.

The following (graphics) are illustrative of Brazil's plans for a domestic communications satellite to be used for educational programs.

LAUNCH VEHICLE	
TYPE	NASA Thor Delta 2914
PAYLOAD	700 Kg

BRAZIL SATELLITE SYSTEM

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SPECIAL SERVICES TO REMOTE LOCATIONS

2 NATIONAL SECURITY NETWORK

22 COMPLETE BACK-UP FOR TRUNK TELEPHONY
AND NATIONAL TV

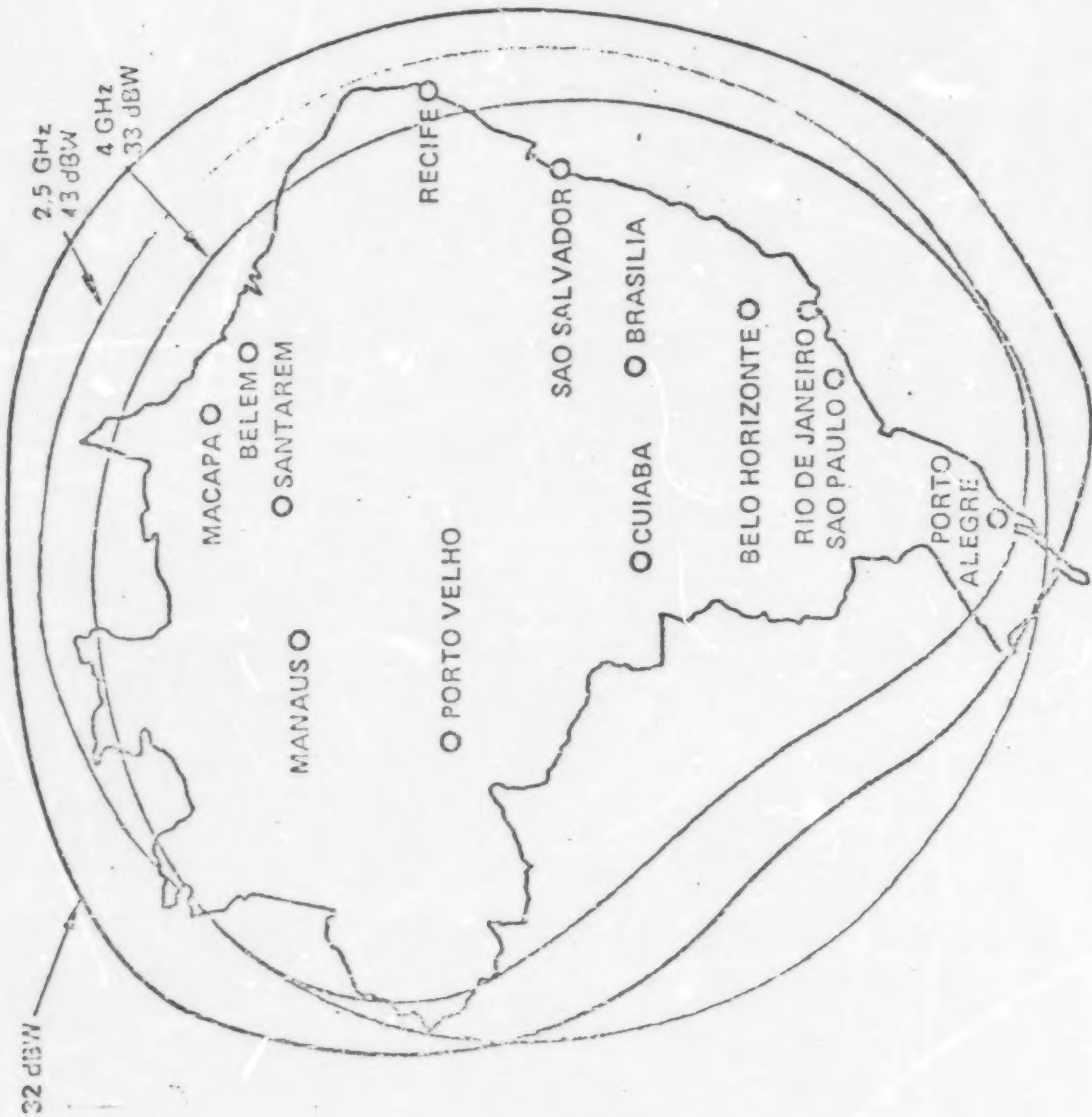
COMMUNITY AND INSTRUCTIONAL TELEVISION



BOOSTER PAYLOAD CAPABILITIES

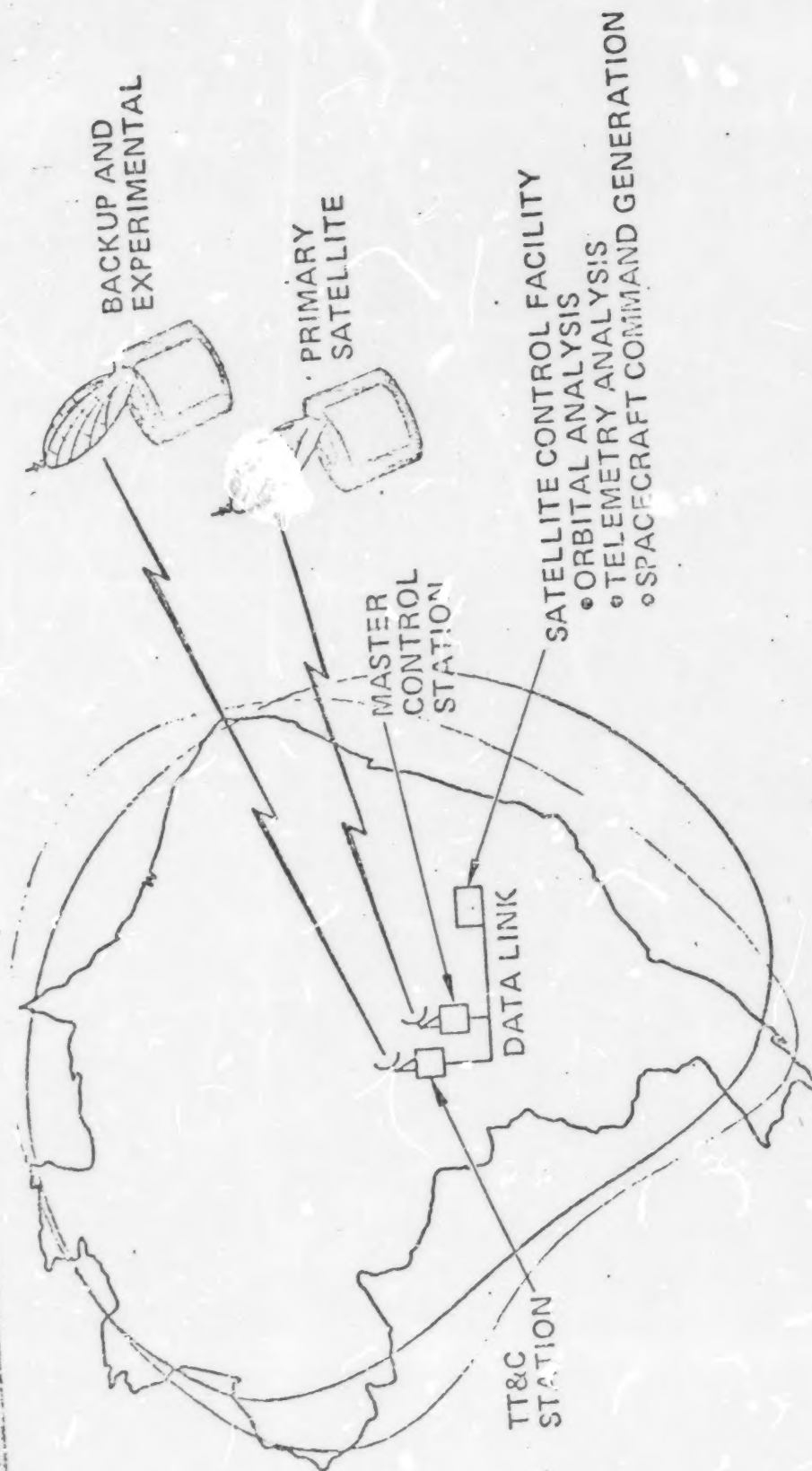
BOOSTER/AVAILABILITY	COST, \$M	MASS INTO TRANSFER ORBIT, KG	SPACECRAFT	COMMUNICATION PAYLOAD (TRANSPONDERS)
THOR DELTA				
• 1914/CURRENT	8.2	590	CANADIAN SATELLITE (HS333)	12 AT 6/4 GHz
• 2314/1974	8.5	700	BRAZIL SATELLITE (HS339)	12 AT 6/4 GHz 1 HIGH POWER AT 2.5 GHz
ATLAS CENTAUR				
• ATLAS-3C /CURRENT CENTAUR-D	17	1550	INTELSAT IV A AT&T DOMESTIC	24 AT 6/4 GHz WITH SPATIAL OR POLARIZATION ISOLATION
• ATLAS-3D /1975 CENTAUR-DIA	20	1770	FOLLOW-ON U.S. DOMESTIC SYSTEMS	MULTIPLE FREQUENCIES, FREQUENCY REUSE

ANTENNA COVERAGE PATTERN



IN-ORBIT OPERATIONS

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PART IV

GRADUATE PROGRAM IN EDUCATIONAL TECHNOLOGY

GRADUATE PROGRAM IN EDUCATIONAL TECHNOLOGY

EDUCATIONAL PHILOSOPHY OF INPE (FOR FURTHER INFORMATION SEE CATALOGUE)

The next years will be decisive in establishing Brazil among the nations developing activities linked to space.

It is obvious that the scientific and technological aspects of Brazil's space problems will only be resolved when it has a significant corp of scientists in terms of quality and quantity.

It is urgent that a group of high-level scientists capable of administering projects, directing laboratories, and orienting other specialists, be selected and trained as a first step for the formation of a Master's degree program; given the lack of Brazilian educational centers to develop these students, INPE is concentrating all its resources in order to build up the potential for good engineers, physicists, meteorologists, economists, geologists, sociologists, educators and administrators.

The structure of this program conforms with the directives for granting graduate degrees established by the Federal Council of Education of the Federal Ministry of Education and Culture. Our Post-Graduate Program envisages granting masters and doctoral degrees in the following essential areas.

1. Systems Analysis and Applications

2. Space and Atmospheric Science
3. Electronics and Telecommunications
4. Computer Science
5. Remote Sensing Applications
6. Educational Technology

The Master's Degree program in Educational Technology was initiated by the Institute of Space Research, INPE, in São José dos Campos, São Paulo, Brasil in January of 1973. The primary objective of the program is to train students at the graduate level to plan, implement, and evaluate instructional systems based on the Systems Analysis approach.

The program is designed to equip students to manage or participate in educational research and development activities in institutional settings, public school systems, the community, government agencies, and in private industry.

All graduates of the program will be knowledgeable in the areas of educational research, statistics, experimental design, educational psychology, systems analysis, and communications media applications.

Requirements for the Degree include demonstrated mastery of one of two areas of concentration: Instructional Systems Development; Educational Research and Evaluation.

The two concentration areas include:

1. Basic and applied research methodology
2. Statistical and experimental design
3. Educational Testing development and measurement
4. Instructional media applications
5. Computer applications
6. Learning theory
7. Educational planning and evaluation
8. Instructional materials development
9. Systems analysis and decision theory.

A student's program may include courses in other graduate programs of the Institute as well, in order to achieve an interdisciplinary approach to his overall goals and development.

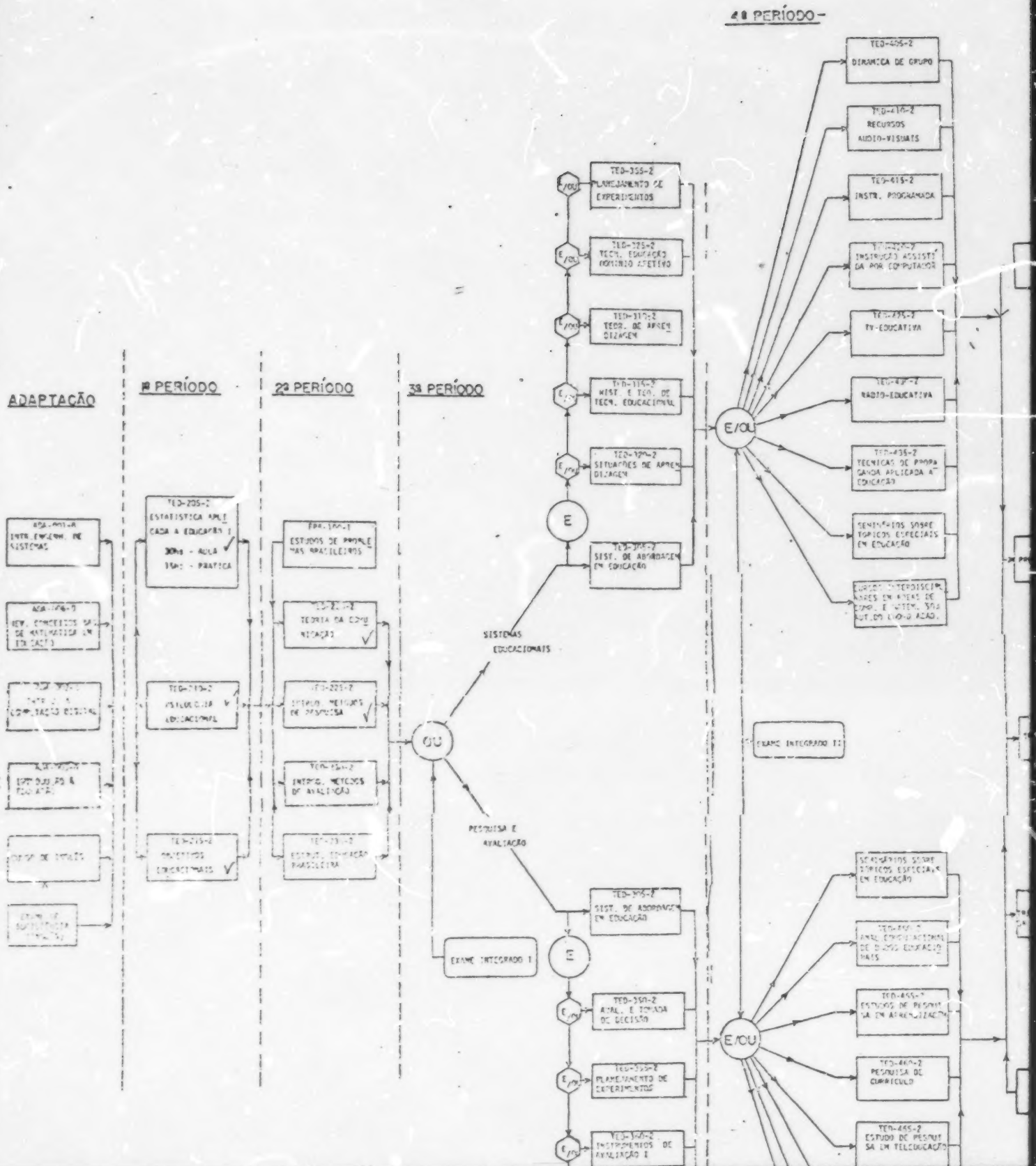
Several courses in the Masters' Program are obligatory for all students in order to form an essential core of learning, a "common language" among students who come to INPE from a variety of different disciplines, including, education, communications, sociology, anthropology, arts, economics, and agronomy.

Following this period of development, each student, with the assistance of his academic advisor, may select courses in one of the concentration areas which best meet individual, professional interests and needs, and which will combine to provide him with depth of knowledge

in that particular area, and ultimately with a specialization.

The program provides a sound, theoretical base in the classroom which is complemented by applied research and development in the SACI project, an on-going experimental educational project involving advanced technology.

GRAPHIC I



EDS-100-2
INTRO. ENGENH. DE
SISTEMAS

ADM-100-2
REV. CONCEITOS GERAIS
DE ADMINISTRAÇÃO EM
EDUCAÇÃO

EDS-100-2
INTRO. A
COMPUTAÇÃO DIGITAL

ADM-100-2
INTRODUÇÃO A
ECONOMIA

ADM-100-2
MÉTODOS DE
ESTATÍSTICA

ADM-100-2
CONCEITOS GERAIS
DE ADMINISTRAÇÃO

TED-205-2
ESTATÍSTICA APLICADA
A EDUCAÇÃO I
300h - AULA
150h - PRÁTICA

TED-210-2
PSICOLOGIA V
EDUCACIONAL

TED-215-2
MÉTODOS
EXPERIMENTAIS

EDS-100-2
ESTUDOS DE PSICOLOGIA
ESTATÍSTICA

TED-220-2
TEORIA DA COMUNICAÇÃO

TED-225-2
INTRO. MÉTODOS DE PESQUISA

TED-230-2
INTRO. MÉTODOS DE AVALIAÇÃO

TED-235-2
ESTUDOS DE EDUCAÇÃO
PSICOLÓGICA

OU

SISTEMAS
EDUCACIONAIS

PESQUISA E
AVALIAÇÃO

EXAME INTEGRADO I

TED-300-2
SISTEMAS DE AVALIAÇÃO

TED-305-2
SIST. DE AVALIAÇÃO
EM EDUCAÇÃO

TED-310-2
SIST. DE AVALIAÇÃO
EM EDUCAÇÃO

TED-315-2
ANAL. E TOMADA
DE DECISÃO

TED-320-2
PLANEJAMENTO DE
EXPERIMENTOS

TED-325-2
INSTRUMENTOS DE
AVALIAÇÃO I

TED-330-2
MÉTODOS DE AVALIAÇÃO
QUALIT./QUANTITAT.

TED-335-2
ESTAT. APLICADA A
EDUCAÇÃO II

TED-340-2
FUND. SOCIO.PSIC.
DA EDUCAÇÃO

EXAME INTEGRADO II

TED-400-2
TÉCNICAS DE PROVA
DADA APLICADA A
EDUCAÇÃO

SEMINÁRIOS SOBRE
TÓPICOS ESPECIAIS
EM EDUCAÇÃO

CURSOS INTERDISCIPLINARES
EM ÁREAS DE
COMP. E SISTEMAS
AUTOMATIZADOS

SEMINÁRIOS SOBRE
TÓPICOS ESPECIAIS
EM EDUCAÇÃO

TED-405-2
ANAL. COMPARATIVA
DE DIFERENTES
EDUCAÇÕES

TED-410-2
ESTUDOS DE PSICOLOGIA
EM AVALIAÇÃO

TED-415-2
PESQUISA DE
CURRÍCULO

TED-420-2
ESTUDO DE PSICOLOGIA
EM AVALIAÇÃO

TED-425-2
OBJETIVOS, PLANEJAMENTO
EM PESQUISA CIENTÍFICA

TED-430-2
INSTRUMENTOS
AVALIAÇÃO II

CURSOS INTERDISCIPLINARES
EM ÁREAS DE COMP. E SISTEMAS
AUTOMATIZADOS

E/OU

PROJECT SACI AS A LABORATORY FOR THE MASTER'S PROGRAM

In addition to the experimental objectives of the SACI project, INPE is concerned with the formation of professional personnel at the highest level. In this sense the project itself serves as a learning laboratory.

The Masters' program encompasses all the activities of the project, making possible a direct and immediate link between theory and practice, providing reliable feedback to the educational planner, the researcher, the producer, and the decision maker.

In this closely integrated work/study program, INPE provides selected personnel with a unique opportunity to study for the Master's Degree, free of cost, while at the same time earning a salary as a professional where he is developing highly specialized job related skills.

Project SACI offers a wide range of activities in which to test educational hypotheses, develop critical judgement, and expand his capacities to turn out consistently professional work, under "real-life conditions", such as daily radio and TV production schedules, quality control standards, and systematized planning and organizational controls.

These project activities include: educational planning;

development of curriculum; formulation of lesson plans; writing of scripts, radio and TV production; evaluation design, interpretation and analysis of data; teacher training, supervision; and administration.

FACILITIES FOR THE EDUCATIONAL TECHNOLOGY PROGRAM

The Central Library of INPE, with approximately 7,000 books, 550 periodical titles, and 15,000 documents, representing all scientific disciplines, and the resources of the Project SACI library, devoted specifically to Educational Technology, has been placed at the disposal of the students for reference and study.

The radio and TV studios at INPE/São José dos Campos offer resources for making and processing photographs and films (16 mm), graphic arts, animations, instructional radio and TV productions.

The TV studio at INPE/Natal, in the State of Rio Grande do Norte, offers similar technical resources which will carry out small scale research experiments related to Project SACI following the formation of the Natal team in August of 1974.

During the next academic period, the new Experimental Laboratory in Technology and System (LETS) at INPE/São José dos Campos will provide additional resources for applied research and development for the purpose of testing and applying experiments in educational technology in Rio Grande do Norte.

This experimental laboratory will be equipped with: audio-visual resources such as video-tape recorders, cameras, projectors, cassette tape recorders, computer access, etc. With this equipment, small-scale experiments will be conducted in projects concerning curriculum, the potential and limitations of educational technology in terms of communications, the creation of prototypes in terms of software for technology, accompanying material, and innovations in the teaching-learning process.

INPE students have access to computer facilities for their course work and research. The Data Processing Division makes available specialized personnel to provide assistance in research programs, as well as to offer courses regarding the use of the equipment.

The INPE Computer Center includes the Burroughs B-6700 model, with 400,000 bytes of memory in the CPU, magnetic tapes, discs and other conventional peripherals.

RESEARCH

Examples of applied research and development under consideration are the following:

- Development of curriculum for educational TV and radio, programmed instruction, and other accompanying material;

- Educational technology and rural communities;
- Education and social change;
- Educational TV for teacher training;
- Content, image and reinforcement related to educational media;
- Learning theory and media programming;
- Systems Analysis and educational planning;
- Costs/benefits in education;
- Evaluation models for decision making;
- Learning modes.

FUTURE DIRECTIONS

An obvious issue is one of flexibility, individualization on the graduate level.

Rigid patterns of instruction impede the initiative of both the teacher and the learner. Uniform programs are likely to ignore some of the basic tenets of individual human differences in learning behavior and values.

Educators have found that this approach brings us an environment which is increasingly controlled, but with little sense of unity, spirit, or aesthetic concern.

Our alternative strategy is to plan a program which is

experience-based and individualized, using technology as a catalyst in the learning process.

Our students will be encouraged to create their own educational programs, unique in style and content, tailored to their individual needs and interests, but designed to reach pre-set educational standards and objectives.

Among the educational options which students would be able to design and use in carrying out these programs are:

- (1) Internships with other institutions and agencies;
- (2) Apprenticeships with master craftsmen and other skilled individuals in the field;
- (3) Seminars and classes facilitated by INPE and various universities and graduate level institutions in São Paulo;
- (4) Seminar and classes facilitated by community resource people;
- (5) One-to-one learning situations with tutors, other students or media-based instruction;
- (6) Independent projects that are self-designed and directed;
- (7) Access to centers of learning and Educational Technology projects outside of the state or the country.

The question comes down to whether or not we use a graduate program as a means of laying on an education in a uniform fashion or whether

we are willing to let it become a tool of the individual as he takes the activist role in creating his own educational experience.

The planner keeps in mind that as technology progresses, mere factual knowledge becomes less and less important to the individual. We have more and better encyclopedias and computer banks to carry this burden everyday.

With courage and imagination, there is an opportunity to focus on planning and improving the human environment systematically, and in maximizing human potential.

In January of 1974, INPE opened its doors to invite a representative number of students from all regions of Brazil to participate in our unique work/study program.

Dr. Fernando de Mendonça, Director General of INPE, would like me to take this opportunity to invite two students, attending the AECT Conference, to work and study with us next year. We believe such an exchange of ideas, and experience, a sharing of skills and resources between students of different backgrounds will be stimulating and advantageous to all concerned.

I would like to thank you very much for the opportunity to present the current status of Brazilian efforts to develop a viable system of satellite education.

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